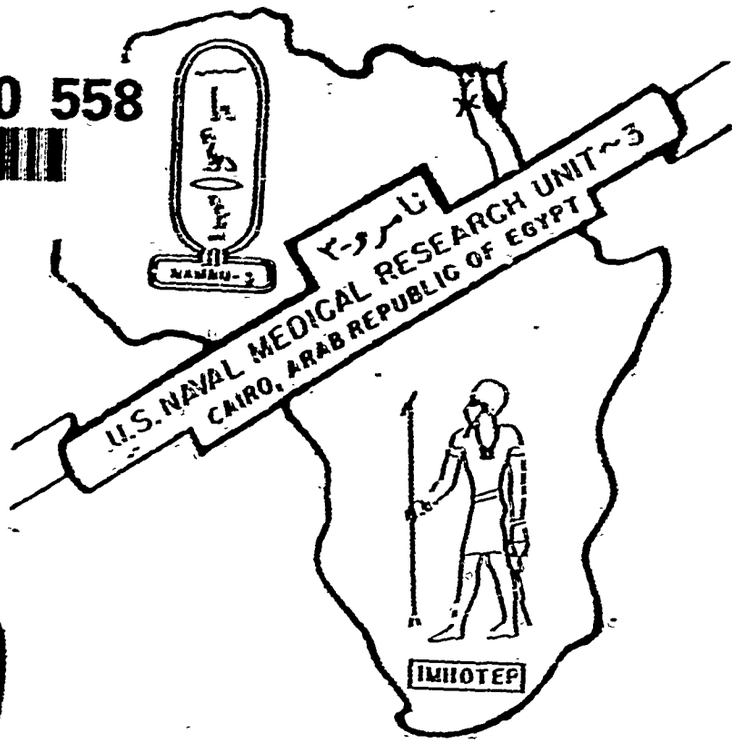
(2)



PUBLICATION REPORT

1563

45/89-60

MICROBIOLOGIC AND CLINICAL STUDY OF ACUTE DIARRHEA IN CHILDREN IN ASWAN, EGYPT

BY

Isis A. Mikhail, Kenneth C. Hyams, John K. Podgore, Richard L. Haberberger, Abdulla M. Boghdadi, Noshy S. Mansour and James H. Woody

U.S. NAVAL MEDICAL RESEARCH UNIT NO. 3
(CAIRO, ARAB REPUBLIC OF EGYPT)
FPO NEW YORK 09527

Scand J Infect Dis 21:59–65, 1989

Microbiologic and Clinical Study of Acute Diarrhea in Children in Aswan, Egypt

ISIS A. MIKHAIL,[1] KENNETH C. HYAMS,[2] JOHN K. PODGORE,[3] RICHARD L. HABERBERGER,[4] ABDULLA M. BOGHDADI,[5] NOSHY S. MANSOUR[6] and JAMES N. WOODY[7]

From the Departments of [1]Bacteriology, [2]Epidemiology, [5]Parasitology, U.S. Naval Medical Research Unit No 3, [4,6] NAMRU-3, Cairo, Egypt, and [3]Pediatrics, Fitzsimmons Army Medical Center, USA

Children with diarrhea presenting to a Government Rehydration Center in Aswan, Egypt, were investigated to determine the etiology and clinical presentation of acute childhood diarrhea in southern Egypt. Among 126 outpatients and 25 inpatients with diarrhea (mean age 18 months), enterotoxigenic Escherichia coli (ETEC) (17 % of cases), Cryptosporidium (9 %), Salmonella spp. (7 %), Campylobacter jejuni/coli (7 %), and Shigella spp. (5 %) were the most common enteropathogens identified during the high incidence season of July. Enteropathogens were isolated as often from inpatients as outpatients, except for Salmonella spp. and Cryptosporidium, which were recovered more often from inpatients. Salmonella-infected children, in particular, were more ill, feverish, and dehydrated on presentation than other children, resulting in more frequent hospitalization. Except for Salmonella-infected children, children with acute diarrhea usually presented without severe dehydration, which may have been due to frequent initiation of oral rehydration therapy (ORT) by mothers trained by local health care providers. A potential environmental source of ETEC was identified in clay water storage containers commonly used in this area.

K. C. Hyams, MD, Naval Medical Research Institute MS 32, Epidemiology Division, Bethesda, MD 20814-5055, USA. Reprint requests: Research Publication Division, NAMRU-3, FPO, New York 09527, USA

INTRODUCTION

Diarrheal disease is a major public health problem in most developing countries, especially in children (1, 2). In Egypt, enterotoxigenic Escherichia coli (ETEC), Salmonella spp., Shigella spp., and rotavirus have been found to be major causes of diarrhea (3, 4). In an effort to control diarrheal disease in children, the Egyptian Government has instituted an extensive oral rehydration program involving public education and training by local health care providers, television advertisements, and newspaper stories. The purpose of the present study was to investigate the etiology and clinical presentation of acute diarrhea in children in southern Egypt.

MATERIALS AND METHODS

During a 3 week period in July 1986, children with diarrhea presenting to the Government Rehydration Center in the Aswan General Hospital were investigated. The center is a primary care facility for the city of Aswan and sees few patients referred from other clinics. Most patients are from a low socioeconomic background, and in this population, children are usually breast-fed until approximately 1 year of age. July was chosen for the study because the hot summer months are considered the high incidence season for diarrhea in this area with a dry desert climate.

Children were eligible for inclusion in the study if 5 years of age or less and if presenting with the complaint of at least 4 unformed stools during the previous 24 h. Children who had received antibiotic therapy were not excluded from the study. Children requiring hospitalization from the rehydration center were considered inpatients; all other children not requiring hospitalization were classified as outpatients. Children ≤5 years without diarrhea or other gastrointestinal complaints presenting for

medical care at an outpatient pediatric clinic in the same hospital were eligible for inclusion in the study as controls.

After informed consent was obtained from a parent, a stool sample was collected and an epidemiologic questionnaire was completed on each patient. The questionnaire was administered to the parent, usually the mother, in Arabic by an Egyptian pediatrician who also evaluated the patient clinically. Stool cultures were transported to the microbiology laboratory and cultured within 1 h of collection.

Patient and control stool specimens were cultured directly onto MacConkey's (MAC), Salmonella-Shigella (SS), Hecktoen (HK), thiosulfate-citrate-bile salts-sucrose (TCBS) agars, and into selenite F enrichment broth. Selenite broth was subcultured onto MAC, HK and SS agars after overnight incubation (35°C). All plates were examined for Salmonella spp., Shigella spp., Aeromonas hydrophila, Plesiomonas shigelloides, and Vibrio spp., using standard microbiologic methods, the API 20E system (Analytab Products, Plainview, NY, USA), and commercial antisera when indicated (Difco, Detroit, MI, USA) (5). For the detection of Campylobacter jejuni/coli, stools were cultured on Blaser's selective medium, which was incubated at 42°C for 48 h under microaerophilic conditions (6). All bacterial pathogens were evaluated for their antimicrobial susceptibility patterns by the Bauer-Kirby method (7).

For the detection of ETEC, 5 lactose positive colonies with typical E. coli morphology were selected from MAC plates and maintained on individual nutrient agar stabs. The presence of heat-labile enterotoxin (LT) was determined by the Y-1 adrenal cell assay (8). Heat-stable enterotoxin (ST) was determined by the suckling mice assay (9). ETEC were identified by the production of either LT or ST. For the detection of enteroinvasive E. coli (EIEC), the standard Sereny test was employed, but to diminish the number of guinea pigs required, all E. coli strains were screened for lysine decarboxylase activity and motility and only those strains which were negative for both were evaluated (10). Giardia lamblia and Entamoeba histolytica were screened for by the merthiolate-iodine-formaldehyde-concentration (MIFC) method (11). Oocysts of Cryptosporidium were identified by microscopic examination of stool smears stained by a modified acid-fast method (5). Rotavirus was detected by enzyme immunoassay (Rotazyme, Abbott Laboratories, North Chicago, Ill., USA).

Environmental samples of clay pots, "Zeirs," used to store water in Aswan were made by dipping a sterile cup into the top of each Zeir in a manner similar to the usual method of obtaining drinking water. 100 ml of water obtained from each Zeir was filtered through a 0.45 micron filter, which was then cultured on M-Endo agar. Typical coliform growth was subcultured to MAC agar for identifica-

Table I. *Comparison of enteric pathogens isolated from outpatients and inpatients*

	Outpatients			Inpatients			Total positive	
		Positive			Positive			
Enteropathogen	No. tested	No.	%	No. tested	No.	%	No.	%
Shigella spp.	126	8	6.3	25	0		8	5.3
Salmonella spp.[a]	126	2	1.6	25	9	36.0	11	7.3
Campylobacter	126	8	6.3	25	2	8.0	10	6.6
ETEC[b]								
Both ST and LT positive	114	2	1.8	21	0		2	1.5
LT positive alone	114	5	4.4	21	2	9.5	7	5.2
ST positive alone	114	14	12.3	21	0		14	10.4
EIEC	21	0		6	0		0	
A. hydrophila	126	1	0.8	25	0		1	0.7
Rotavirus[c]	123	26	21.1	25	1	4.0	27	18.2
G. lamblia[d]	123	35	28.5	25	7	28.0	42	28.4
E. histolytica	123	1	0.8	25	0		1	0.7
Cryptosporidium[e]	126	6	4.8	25	7	28.0	13	8.6

[a] $p<0.001$, outpatients vs. inpatients, Fisher's exact test.
[b] E. coli could not be isolated from all stool specimens.
[c] $p<0.05$, outpatients vs. inpatients, Fisher's exact test.
[d] Insufficient stool was available for complete testing for rotavirus, Giardia, and E. histolytica.
[e] $p<0.01$, outpatients vs. inpatients, chi-square test.

tion and selection of E. coli. E. coli colonies were processed for heat-labile and heat-stable toxins using the same techniques described for stool analysis.

Statistical analyses were done using the chi-square test with Yates' correction or Fisher's exact test to test for differences between proportions. Comparisons of mean values were done using the Student's *t*-test or Wilcoxon rank sum test. Probabilities of <0.05 were considered statistically significant.

RESULTS

There were 126 outpatients and 25 inpatients entered into the study (mean age 17.7 months; range, 1–60 months). 64% of the patients were male and 36% were female. Approximately one-fourth of the parents with children eligible for the study were willing to give consent and wait long enough for their child to provide stool specimen. Children had complained of diarrhea for an average of 3.5 days prior to being seen and had an average of 5.7 stools during the previous 24 h. Antibiotics had been received by 17.2% of patients with diarrhea.

ETEC was the most commonly isolated bacterial pathogen (Table I). LT and/or ST producing strains were found in 17% of stools from children with diarrhea. Other common bacterial pathogens included Salmonella spp. (1 S. typhi, 10 S. typhimurium), found in 7% of stools; C. jejuni/coli, also found in 7% of stool specimens; and Shigella spp. (3 S. dysenteriae, 4 S. flexneri, 1 S. boydii), found in 5% of stools. A. hydrophila was isolated in just 1 patient with diarrhea, and EIEC was not isolated from any study subject.

Bacterial enteropathogens were identified in 31.8% of 151 diarrheal stools. Mixed infections were found in 5 patients. Campylobacter plus Salmonella and Salmonella plus ETEC was isolated in 2 inpatients. In 3 outpatients, Campylobacter plus ETEC was

Table II. *Clinical characteristics for the major enteropathogens isolated from 151 patients with diarrhea*

ORT=Oral rehydration therapy

Characteristic	Enteropathogen						
	Salmonella (n=11)	Shigella (n=8)	Campylobacter (n=10)	ETEC (n=23)	Cryptosporidium (n=13)	Giardia (n=42)	Rotavirus (n=27)
Age in months (mean)	23.3	31.3	14.0	13.5	10.6	20.4	14.8
Duration of symptoms in days (mean)	5.0	2.3	3.5	4.0	4.1	3.5	2.6
No. stools/24 h (mean)	5.4	6.3	5.6	5.2	7.2	5.2	5.9
Symptoms (% with complaint)							
Mucus in stools	63.6	37.5	60.0	17.4	30.7	38.1	25.9
Blood in stools	27.3	25.0	20.0	8.7	15.4	7.1	7.4
Abdominal pain	54.6	100.0	100.0	78.3	53.9	73.8	81.5
Fever	90.9	87.5	80.0	56.5	84.6	57.1	63.0
Vomiting	54.6	62.5	50.0	43.5	69.2	50.0	63.0
Severe dehydration (>10%)	90.9	0	10.0	8.7	7.7	2.4	0
Therapy prior to admission							
Antibiotics (% treated)	45.5	37.5	30.0	8.7	46.2	11.9	14.8
ORT (% treated)	63.6	25.0	30.0	21.7	46.2	16.7	11.1

isolated twice, and Campylobacter plus Shigella was found once. Campylobacter was thus involved in 4/5 mixed bacterial infections.

Bacterial pathogens were isolated as often from inpatients as outpatients, except for Salmonella spp., which was recovered significantly more often from inpatients than outpatients (36.0% vs. 1.6%, $p<0.01$) (Table I). Salmonella-infected children were more feverish, clinically ill, and dehydrated on presentation than other children, which resulted in more frequent hospitalization. More than 90% of salmonella-infected children were found to be severely dehydrated (>10%), a rare finding in other children presenting with diarrhea (Table II). Also, complaints of blood and mucus in stools were more often associated with salmonella infection compared to other enteropathogens. Salmonella- and shigella-infected children tended to be older (mean age 26.6 months) than other children with acute diarrhea (mean age 16.5 months).

Nearly all salmonella strains were resistant to antibiotics commonly used to treat diarrhea in this area, including tetracycline, trimethoprim-sulfamethoxazole, and ampicillin. In addition to multiple resistance found in Salmonella spp., significant resistance was observed in other bacterial isolates, including one campylobacter isolate which was resistant to erythromycin (Table III).

Oocysts of Cryptosporidium were found in the stools of 6 outpatients and 7 inpatients (Table I). Patients infected with Cryptosporidium tended to be slightly more ill and to have had a larger number of stools than other patients, which was reflected in a higher percentage of inpatients than outpatients with cryptosporidiosis (Table II). Cryptosporidium tended to be associated with the concurrent isolation of Campylobacter: in 2 outpatients and 2 inpatients Cryptosporidium was simultaneously identified with Campylobacter. Whether the family of the patient raised animals or kept animals at there homes was not associated with Cryptosporidium, Campylobacter, or any other enteropathogens isolated in this study.

All bacterial pathogens were isolated more frequently from patients than from controls. 53 bacterial pathogens were isolated from 151 diarrheal stools, compared to 2 pathogens (1 S. typhimurium and 1 Campylobacter) isolated from 28 control stools. Also, Cryptosporidium was not identified in any controls, and trophozoites of E. histolytica were found in only 1 outpatient with diarrhea. In contrast, rotavirus and G. lamblia were identified as frequently in stools from patients with diarrhea as from controls. Rotavirus was found in 18.2% of 148 diarrheal stools and in 14.8% of 27 control stools, and Giardia was found in 28.4% of 148 diarrheal stools and in 32.1% of 28 control stools. Direct comparison between patients and controls was not possible, however, because control patients with-

Table III. *Resistance patterns of the most commonly isolated enteric pathogens*

ND = not done

	No. of resistant strains/no. examined (%)			
Isolate	Ampicillin	Tetracycline	Chloramphenicol	Trimethoprim/sulfa
Salmonella spp.[a]	10/11 (90.9)	10/11 (90.9)	10/11 (90.9)	10/11 (90.9)
Shigella spp.	3/8 (37.5)	3/8 (37.5)	3/8 (37.5)	1/8 (12.5)
ETEC	13/23 (56.5)	5/23 (21.7)	1/23 (4.3)	7/23 (30.4)
Campylobacter	4/10 (40.0)	2/10 (20.0)	ND	10/10 (100.0)

[a] All 10 resistant Salmonella were S. typhimurium

out diarrhea were significantly older (mean age 42 months) than patients with diarrhea (mean age 18 months).

Analysis of epidemiologic data indicated that of patients with stools positive for ETEC, a higher percentage (78%) lacked an indoor home water faucet compared to patients with other causes of diarrhea (42%) and controls (21%; $p<0.01$, both comparisons). Because of the possibility that a common form of water storage in clay pots (Zeirs) could be a source of diarrheal pathogens, a random survey of 18 Zeirs located in areas where patients lived was made 1 year after the initial study. Numerous coliforms were identified in 10/18 Zeirs, and in 2, ST producing E. coli were found.

There were no deaths during the study period, and none of the outpatients, who were all treated with oral rehydration therapy (ORT) as recommended by the World Health Organization, later required hospitalization for diarrhea or dehydration. This may have been due in part to the fact that most patients with acute diarrhea presented without severe dehydration because mothers frequently instituted ORT at home (25% of patients). Only in salmonella-infected children did ORT instituted at home not appear adequate to prevent dehydration (Table II).

DISCUSSION

Similar enteropathogens were found in this population with diarrhea in southern Egypt as have been found in northern Egypt (3, 4). ETEC was the most common bacterial pathogen isolated, with Salmonella spp., Campylobacter, and Shigella less commonly found. Cryptosporidium, an enteric pathogen which has only recently been looked for in Egypt, was also found to be a potential significant cause of diarrhea in children (12, 13).

Although the control group was not strictly comparable to the diarrheal group, Giardia was identified as frequently in controls as in cases of acute diarrhea. G. lamblia has been found in a high percentage of asymptomatic controls in other studies conducted in Egypt, which suggests that infection with Giardia may not always cause acute diarrhea in this population (3). The fact that rotavirus was also found equally as often in cases as in older controls was contrary to the findings of previous studies conducted in Egypt, but similar to reports from other areas (3, 4, 14, 15). However, only 4 patients in the control group were positive for rotavirus, making comparisons difficult.

Finding Salmonella spp. and Cryptosporidium more often in patients requiring hospitalization suggests that these 2 organisms may be more pathogenic than other causes of diarrhea. Salmonella has previously been found to be a cause of fatal and potentially fatal diarrhea in infants in Egypt (4). The role of Campylobacter as a cause of acute diarrhea, in contrast, was less clear because it was isolated as a single pathogen in only 5/11 diarrheal stools positive for Campylobacter. The frequent identification of Cryptosporidium and Campylobacter together may indicate similar sources and methods of transmission, possibly from infected animals (16).

Finding more patients in this study without a home water tap infected with ETEC prompted a search for a common source of infection. Water is frequently stored for household and community use in Aswan in large porous clay pots, Zeirs, covered by loose-fitting wooden lids which allow for easy contamination. Usually located in front of houses and along roads, Zeirs provide public drinking water kept cold by evaporation of water through the sides of the porous pots. For people who do not have water piped into their home and have to carry water from a community water tap, Zeirs may be a primary source of water for household use. The isolation of ETEC in water storage jars, therefore, suggests one possible source of diarrheal infection. Although causality could not be demonstrated in this study, examples of waterborne outbreaks of ETEC have been

reported, lending support to this possibility (17, 18). Alternatively, the lack of a home water tap may indicate a lower socioeconomic level and other risk factors for the acquisition of ETEC (14).

The most gratifying finding of the study was the high level of understanding and practical use of oral rehydration therapy by mothers of young children in Aswan. Mothers of patients were not just aware of the benefits of ORT but were knowledgeable enough to request the government supplied rehydration packets and use them effectively. Mothers were, in fact, so knowledgeable about the benefits of ORT that many were unwilling to wait for their child to produce a stool specimen because they did not see a need. This demonstrates the progress that can be made in implementing public health measures in developing countries when a concerted effort is made to educate the public (19).

ACKNOWLEDGEMENTS

This research was supported by the Naval Medical Research and Development Command, NMC, NCR, Bethesda, MD, USA, Work unit No. 3M161102BS10.AA.421-3. The opinions and assertions contained herein are the private ones of the authors and are not to be construed as official or reflecting the views of the US Department of the Navy, the naval service at large, or the Ministry of Health of Egypt. Informed consent was obtained from patients or their immediate relatives and guidelines for human experimentation of the NAMRU-3 Committee for the Protection of Human Subjects were followed in the conduct of this research.

REFERENCES

1. Snyder JD, Merson MH. The magnitude of the global problem of acute diarrhoeal disease: A review of active surveillance data. Bull WHO 60: 605–613, 1982.
2. Rhode JE. Selective primary health care: Strategies for control of disease in the developing world. XV. Acute diarrhea. J Infect Dis 6: 840–854, 1984.
3. Zaki, AM, DuPont HL, El-Alamy MA, Arafat RR, Amin K, Awad MM, Bassiouni L, Iman IZ, El-Malih GS, El-Marsafie A, Mohieldin MS, Naguib T, Rakha MA, Sidaros M, Wasef N, Wright CE, Wyatt RG. The detection of enteropathogens in acute diarrhea in a family cohort population in rural Egypt. Am J Trop Med Hyg 35: 1013–1022, 1986.
4. Shukry S, Zaki AM, DuPont HL, Shoukry I, El-Tagi M, Hamed Z. Detection of enteropathogens in fatal and potentially fatal diarrhea in Cairo, Egypt. J Clin Microbiol 24: 959–962, 1986.
5. Lennette EH, Balows A, Hausler WJ Jr, Truant JP, eds. Manual of clinical microbiology, 4th ed. Washington, DC: American Society for Microbiology, 1985.
6. Blaser MJ, Glass RI, Huq MI, Stoll B, Kibriya GM, Alim RMA. Isolation of Campylobacter fetus subsp. jejuni from Bangladeshi children. J Clin Microbiol 12: 744–747, 1980.
7. Bauer AW, Kirby WMM, Sherris JC, Turck M. Antibiotic susceptibility testing by a standardized single disk method. Am J Clin Pathol 45: 493–496, 1966.
8. Sack DA, Sack RB. Test for enterotoxigenic E. coli using Y-1 adrenal cells in miniculture. Infect Immun 11: 334–336, 1975.
9. Giannella RA. Suckling mouse model for detection of heat-stable E. coli enterotoxin: Characteristics of the model. Infect Immun 14: 95–99, 1976.
10. Silva RM, Regina FT, Trabulsi LR. Biochemical and cultural characteristics of invasive E. coli. J Clin Microbiol 11: 441–444, 1980.
11. Blagg W, Schloegel EL, Mansour NS, Khalaf GI. A new concentration technic for the demonstration of protozoa and helminth eggs in feces. Am J Trop Med Hyg 4: 23–28, 1955.
12. El-Saifi A, Kamel M, El-Din AM, Zaghloul I, Podgore JK, Mansour NS, Mikhail I. Parasitic, bacterial and viral etiology of acute diarrhea in Egyptian children. Med J Cairo University 53: 373–379, 1985.
13. Azab ME, Khalil HM, Khalifa AS, Makhlouf SA, Fawzy AFA, Habib FSM. Cryptosporidiosis as a possible cause of diarrhoea in children. Egypt J Pediatr 2: 347–353, 1985.
14. Guerrant RL, Kirchoff LV, Shields DS, Nations MK, Leslie J, de Sousa MA, Araujo JG, Correia LL, Sauer KT, McClelland KE, Trowbridge FL, Hughes JM. Prospective study of diarrheal illnesses in northeastern Brazil: Pattern of disease, nutritional impact, etiologies, and risk factors. J Infect Dis 148: 986–997, 1983.

15. Burke V, Gracey M, Robinson J, Peck D, Beaman J, Bundell C. The microbiology of childhood gastroenteritis: Aeromonas species and other infective agents. J Infect Dis 148: 68–74, 1983.
16. Current WL, Reese NC, Ernest JV, Bailey WS, Heyman MB, Weinstein WM. Human cryptosporidiosis in immunocompetent and immunodeficient persons. Studies of an outbreak and experimental transmission. N Engl J Med 308: 1252–1257, 1983.
17. Rosenberg ML, Koplan JP, Wachsmuth K, Wells JG, Gangarosa EJ, Guerrant RL, Sack DA. Epidemic diarrhea at Crater Lake from enterotoxigenic Escherichia coli. A large waterborne outbreak. Ann Intern Med 86: 714–718, 1977.
18. Black RE, Merson MH, Rowe B, Taylor PR, Abdul Alim ARM, Gross RJ, Sack DA. Enterotoxigenic Escherichia coli diarrhoea: Acquired immunity and transmission endemic area. Bull WHO 59: 263–268, 1981.
19. Snyder JD, Yunus MD, Wahed MA, Chakraborty J. Home-administered oral therapy for diarrhoea: A laboratory study of safety and efficacy. Trans R Soc Trop Med Hyg 76: 329–333, 1982.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; Distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) 45/89-90	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION U.S. Naval Medical Research Unit No. 3 — 6b. OFFICE SYMBOL (If applicable) NAVMEDRSCHU THREE	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) PSC 452, Box 5000 FPO, AE 09835-0007	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Naval Medical Research and Development Command — 8b. OFFICE SYMBOL (If applicable) NAVMEDRSCH DEVCOM	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code) National Naval Medical Center Building 1, Tower 12 Bethesda, MD 20889-5044	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. 62770A — PROJECT NO. 3M1627-70A870 — TASK NO. AR — WORK UNIT ACCESSION NO

11. TITLE (Include Security Classification)
Microbiologic and Clinical Study of Acute Diarrhea in Children in Aswan, Egypt. (UNCLASSIFIED).

12. PERSONAL AUTHOR(S)
Mikhail, Isis A., Hyams, Kenneth C., Podgore, John K., Haberberger, Richard L., Boghdadi, Abdulla M., Mansour, Noshy S. and Woody, James N.

13a. TYPE OF REPORT	13b. TIME COVERED FROM ____ TO ____	14. DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
		1989	7

16 SUPPLEMENTARY NOTATION
Published in: Scand. J. Infect. Dis., 21:59-65, 1989; Acc. No. 1563.

17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Diarrhea; ETEC; Campylobacter; Salmonella; Shigella; Children; Aswan, Egypt.

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Children with diarrhea presenting to a Government Rehydration Center in Aswan, Egypt, were investigated to determine the etiology and clinical presentation of acute childhood diarrhea in southern Egypt. Among 126 outpatients and 25 inpatients with diarrhea (mean age 18 months), enterotoxigenic Escherichia coli (ETEC) (17% of cases), Cryptosporidium (9%), Salmonella spp. (7%), Campylobacter jejuni/coli (7%), and Shigella spp. (5%) were the most common enteropathogens identified during the high incidence season of July. Enteropathogens were isolated as often from inpatients as outpatients, except for Salmonella spp. and Cryptosporidium, which were recovered more often from inpatients. Salmonella-infected children, in particular, were more ill, feverish, and dehydrated on presentation than other children, resulting in more frequent hospitalization. Except for Salmonella-infected children, children with acute diarrhea usually presented without severe dehydration which may have been due to frequent initiation of oral rehydration therapy (ORT) by mothers trained by local health providers. A potential environmental source of ETEC was identified in clay water storage containers commonly used in this area.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
Research Publications Branch	202-284-1381	R.P.B.

DD FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

☆ U.S. Government Printing Office: 1986—607-044

UNCLASSIFIED